NOC:Bayesian/ MMSE Estimation for Wireless Communications ̤MIMO/ OFDM Cellular and Sensor Networks - Video course

NPTEL

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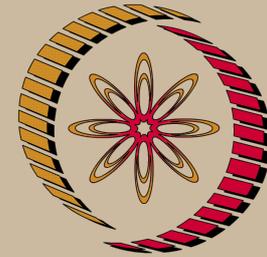
Electronics & Communication Engineering

COURSE OUTLINE

Bayesian or Minimum Mean Squared Error (MMSE) estimation incorporates prior information for the parameter to be estimated and hence yields an improved estimation performance. It also has significant practical applications in MIMO-OFDM based 3G/ 4G wireless systems for channel estimation, equalization as well as in wireless sensor networks (WSNs) and cognitive radio systems.

This is a sequel course in estimation and will cover the Bayesian i.e. Minimum Mean Squared Error (MMSE) framework for estimation and applications to MIMO/ OFDM wireless communications. However, it is NOT necessary for the student to have done the previous course as all the topics will be covered starting from the fundamentals. Thus students can independently do this course without knowledge of the previous course on Maximum Likelihood (ML) estimation.

Pre-requisites:

- BE/ME/MS /PhD can be allowed ̤ Basic knowledge of

  - Probability, random variables
  - Linear Algebra, DSP

Coordinators:

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COURSE DETAIL

Week	Topics
1.	Basics of Estimation, MMSE Principle, Properties –Variance of Estimate
2.	Wireless Flat-Fading Channel Estimation, Pilot-based MMSE Estimate, Properties, Example of Channel Estimation.
3.	LMMSE Principle, LMMSE Vector Parameter Estimation, Properties of LMMSE estimate.

4.	Examples – LMMSE Based Mullti-Antenna Downlink and MIMO Channel Estimation.
5.	Inter Symbol Interference (ISI), Channel Equalization, LMMSE Equalizer, LMMSE example
6.	Introduction to Orthogonal Frequency Division Multiplexing (OFDM) and LMMSE Pilot Based OFDM Channel Estimation, Example
7.	OFDM – Comb Type Pilot (CTP) Transmission, LMMSE Channel Estimation in Time/ Frequency Domain, CTP Example, LMMSE Frequency Domain Equalization (FDE), Example-FDE
8.	Sequential LMMSE (SLMMSE) Estimation – Scalar/ Vector Cases, Applications- Wireless Fading Channel Estimation, SLMMSE Example, Kalman Filter for time-varying channel estimation.

References:

Fundamentals of Statistical Signal Processing

- Author: Steven M. Kay
- Volume I: Estimation Theory